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Abstract

SPECIFIC FEATURES OF HEAT EXCHANGE IN NON COMPRESSIBLE NON-NOILING LIQUID-COOLED REACTORS

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The paper gives the results of a theoretical study of specific features of heat exchange processes in the channels of non compressible liquid-cooled reactors.

The author discusses the possibilities of extending Prandtl's hypothesis about turbulent transfer coefficients to arbitrary flows. Approximate equations for rate and temperature pulsations in an arbitrary liquid flow are derived from formulae written as integral equations describing the transfer of rate and temperature pulsation components. A mathematical analysis of "mixing lengths" introduced by Prandtl is presented.

The author considers the problem of stabilized heat transfer and hydraulic resistance in the reactor channels. The approximation of the turbulent viscosity coefficient is proposed used to calculate stabilized heat transfer and hydraulic resistance in tubes and for streamline flows parallel to rod bundles. The results of calculations in a broad range

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of Reynolds and Prandtl numbers are in good agreement with the available experimental data. The use of the hydraulic diameter for heat transfer and hydraulic resistance calculations is shown to be invalid for the case of streamline flows parallel to bundles of rods. A new method is suggested for determining the equivalent diameter of rod bundles which makes it possible toa apply the tube flow formulae for calculating the heat transfer and hydraulic resistance coefficients in rod bundles.

The paper presents calculations of heat transfer in circular tubes in the initial thermal region and in the sinesection thermal loop- Relaxation length values for the temperature curve are given which help determine heat transfer for an arbitrary thermal loop.

The author discusses the problems of critical thermal loads during surface boiling of heat-transfer agents in the reactor channels and the mechanism responsible for a heat-exchange critical point. An analitical expression is developed for critical thermal loads for tube flows below boiling point. The equation derived well agrees with the experimental data.